PATENT SPECIFICATION 929,088

DRAWINGS ATTACHED.

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929,088

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International Classification :—**B65d** (B67b, F06h).

COMPLETE SPECIFICATION.

Thin-Walled Containers and Thin-Walled Closures for Containers.

We, PLASTIC PACKAGING LIMITED, a Company registered under the Laws of Great Britain, of Cumberland Avenue, Park Royal, London, N.W.10, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to thin-walled containers and thin-walled closures for containers made of resilient sheet material such as polystyrene by moulding, and has for its object to provide a container and/or a closure for a container having a tubular part thereof formed with a screwthread for screwthreaded engagement with a co-operating part so that a container can be closed by a closure having screwthreaded engagement therewith, in which the appropriate tubular part of the container and/or closure can have the screwthreaded formed thereon in the mouding process, e.g. by expansion into a mould under the action of pressure and/or vacuum while in a soft condition, while yet enabling the container or closure after moulding to be removed from the mould without the necessity for rotating it relatively to the mould to unscrew the screwthreaded part thereof from the part of the mould in which the screwthreaded part is formed.

Thus, an object of the invention is to enable containers and/or closures for containers of the screwthreaded type to be formed by moulding, for example in batches from a piece of sheet material by expansion into moulds under air pressure, with or without initial expansion by mechanical means, followed by bodily removal of the articles thus formed from the moulds either still attached to the remainder of the sheet material or no, in the same general way as if the articles were of a form not provided with a screwthread.

In a thin-walled container or a thin-walled closure for a container made of resilient sheet material according to the present invention, the container or the closure includes a thin-walled tubular part having a screwthread of the "reverse buttress" type formed thereon by reformation of the material without substantial change in its thickness, the tubular part on which the screwthread is formed being of mean tapered form with the narrow flank of the reverse buttress thread facing towards the smaller end of the tubular part while the angle of the mean taper is such in relation to the axial length of the wider flank of the reverse buttress thread, and to the angle which this wider flank makes with the axis of the tubular part, that, in cross-sections containing the axis of the tubular part, whereas the wider flank of the thread is inclined at a small angle to the said axis in one sense, the line representing the mean taper of the tubular part is inclined at a slightly larger angle to the said axis in the opposite sense and so that, as regards any two adjacent convolutions of the thread the crown of the convolution lying nearer the smaller end of the tubular part lies nearer to said axis than the root of the convolution lying nearer the larger end of the tubular part.

By the expression "a screwthread of the reverse buttress type" is to be understood a screwthread of which one flank has a relatively long axial length and lies at a small angle to the axis of the thread while the other flank has a negligible or relatively

short axial length and lies at a relatively large angle to the axis of the thread, the relatively long flank being that which in use takes the axial thrust of the co-operating screwthreaded part, as opposed to a buttress thread in which the short flank takes such axial thrust.

By "a thread formed by deformation of the material without substantial change in its thickness" is to be understood a thread formed as a helical corrugation in the material so that the thread form appears on both the outside and the inside of the tubular part although the thread under consideration will in each instance be only that appearing either on the outside or the inside of the tubular part, depending on whether this part constitutes or is arranged to constitute respectively a male or female threaded part. Thus, references to the screwthread herein are to be understood as referring to the thread form which is on that surface of the tubular part which in use co-operates with a co-operating thread form to form a screw connection between a container and a closure.

The construction is such that the screwthread can be formed by moulding and, following such moulding, the article and the mould can be separated by axial displacement without relative rotation, due to the fact that the resilience of the material coupled with the small angle which the wider flank makes with the axis of the tubular part allows each convolution of the thread to be withdrawn axially from the co-operating convolution on the mould while moreover after such withdrawal each convolution, having been separated from the convolution on the mould with which it originally made contact, can be moved clear of the die with little or no further contact with any of the other convolutions on the mould past which it then travels.

When the invention is applied to a container the screwthread might be formed within the bore of the open end of the container, in which case the container would preferably have an annular surface area adjacent to its end arranged to make sealing contact with a corresponding surface area on a flange or the like on an externally screwthreaded closure.

Preferably, however, in a container according to the invention the screwthreaded tubular part is in the form of a tubular collar or flange formed integral with the open end of the container and extending from such open end in the same direction as the body of the container so as to lie around and be spaced from the open end of the body portion of the container. In this case the screwthreaded part would be engaged by a corresponding screwthreaded part of an axially extending flange of a cap-like closure member and the cap-like closure would then preferably have a smooth externally tapered annular rib formed on its inner face and arranged to co-operate and make a sealing joint with a corresponding formation immediately within the open end of the container. Thus, the co-operating screwthreaded parts would serve to draw the rib into close sealing contact with the interior of the open end of the container.

In such a construction it would be understood that the screwthread on the flange of the closure member would conveniently also be formed in a similar manner to the screwthread on the container so that the closure member would itself also be in accordance with the invention.

Thus a preferred form of the invention would comprise a container and a co-operating closure member both according to the invention.

Containers and/or closure members according to the invention would conveniently be made of a thin resilient plastic material such as polystyrene or polyvinyl chloride and where a container and a co-operating closure member, both according to the invention, are provided, different materials may be used for the two parts, for example, for the purpose of preventing or reducing binding of the lid on the container. In any event, the parts are conveniently formed by moulding in a manner generally known *per se* from a sheet of appropriate plastic material which, when in a soft deformable state, is disposed over one or more mould cavities or in contact with the end of a suitable die and then drawn or pressed into close contact with the surfaces of such cavities or such die by the application of fluid pressure and/or vacuum, with or without an initial mechanical deformation of the material into the cavities or over the die before the application of such pressure or vacuum.

One example of a container and of a suitable co-operating closure, both according to the invention, is shown in the accompanying drawings, in which:—

Figure 1 is as to the lefthand half a cross-section on an enlarged scale containing the axis of the container, and as to the right-hand half a side elevation on the same scale;

Figure 2 is a similar view to Figure 1 of the closure, the closure and container being shown as slightly separated from one another in readiness for application of the closure to the container; and

Figure 3 is a plan view of the close member shown in Figure 2.

In the construction shown in the accompanying drawings, the container may be assumed to have a mean diameter of about 2½ inches and be made of polystyrene of a thickness of approximately .012". It com-

prises a body part 1 of somewhat tapered tubular form closed at its lower end by an integral bottom wall 2 while its upper edge portion is turned over as shown to provide a tubular part 3 which is formed in the moulding process with a male screwthread of the reverse buttress type. The tubular turned-over edge portion 3 in which the screwthread is formed is of mean tapered form and the thread formed so that the narrow flank 4 of the thread faces towards the smaller end of the tubular part 3. The angle of the means taper is, as shown, approximately 8°, while the angle which the wider flank 5 of the buttress thread makes with the axis of the tubular part 3 is 6°. Moreover, the angles in question are such in relation to the axial length of the wider flank 5 of the reverse buttress thread that, as regards any two adjacent convolutions of the thread, e.g. 6, the crown of the convolution lying nearer the smaller end of the tubular part 3 lies nearer to the axis of the tubular part than does the root, e.g. 7, of the convolution lying nearer the larger end of the tubular part 3.

The axial length of the wider flank in the example shown may be assumed to be that which will provide seven threads per inch while the radial depth of the narrow flank is approximately .002".

The construction shown is such that the screwthread can be formed by moulding, and so that following such moulding the container and the mould can be separated by axial displacement without relative rotation due to the fact that the resilience of the material, coupled with the small angle which the wider flank 5 makes with the axis of the tubular part, allows the convolutions of the thread to be withdrawn axially from the co-operating convolution on the mould, while moreover, after each convolution has by such withdrawal been separated from the convolution on the mould with which it originally made contact, it can be moved clear of the die with little or no further contact with any of the other convolutions on the mould past which it then travels. The upper end of the container is formed to provide a short frusto-conical internal surface 8 to provide substantially sealing contact with a corresponding surface on the closure as hereinafter described.

The closure comprises a disc-like part 9 an annular portion of which adjacent to its circumferential edge is formed with a downwardly projecting annular rib-like part 10 providing a conical surface to make sealing engagement with the surface 8 of the container referred to above. Depending from the extreme circumferential edge of the disc-like part is a tubular flange 11 formed with a female screwthread of the reverse buttress type similar in form to the screwthread on the container. Thus this tubular part is formed with a screwthread of mean tapered form, the angle of taper being 8° while the wider flank 12 of the reverse buttress screwthread makes an angle with the axis of the screwthread of approximately 6°. As shown, the larger diameter end of the wider flank 12 lies adjacent to the smaller diameter end of the tubular part 11 as a whole.

The dimensions of the closure are such that when it is screwed on to the container, the tapered surface 8 and the part 10 come into close engagement approximately at the moment when during the screwing-down the screwthreads respectively on the closure member and container grip one another over substantially their whole areas due to the 8° mean taper of the parts 3 and 11.

The container is provided with a circumferential rib 13 which when one container is nested in another similar container engages the surface 8 and thus prevents the containers jamming one within the other, while the closure is provided with three downward projections 14 adjacent to its circumference similarly to prevent similar closure members jamming in one another when nested together, and with a ring of serrations as shown at 15.

In a typical example while the container is made of polystyrene the closure member might be made of a hard polyvinyl chloride.

WHAT WE CLAIM IS:—

1. A thin-walled container or a thin-walled closure for a container made of resilient sheet material, including a thin-walled tubular part having a screwthread of "reverse buttress" type formed thereon by deformation of the material without substantial change in its thickness, the tubular part on which the screwthread is formed being of mean tapered form and with the narrow flank of the reverse buttress thread facing towards the smaller end of the tubular part, while the angle of the mean taper is such in relation to the axial length of the wider flank of the reverse buttress thread, and to the angle which this wider flank makes with the axis fo the tubular part that, in cross-sections containing the axis of the tubular part, whereas the wider flank of the thread is inclined at a small angle to the said axis in one sense, the line representing the means taper on the tubular part is inclined at a slightly larger angle to the said axis in the opposite sense and so that, as regards any two adjacent convolutions of the thread, the crown of the convolution lying nearer the smaller end of the tubular part lies nearer to said axis than the root of the convolution lying nearer the larger end of the tubular part.

2. A container as claimed in Claim 1 in

which the tubular screwthreaded part of the container is in the form of a collar or flange which extends from the open end of the container in the same direction as the body of the container so as to lie around and be spaced from the open end of the body portion of the container.

3. A container as claimed in Claim 2 including an approximately frusto-conical surface formed within the end part of the container from which the screwthreaded tubular part extends, such surface being provided to form a seal with a co-operating surface on a closure member.

4. The combination with a container as claimed in Claim 1 or Claim 2 or Claim 3, of a co-operating closure member also as claimed in Claim 1 wherein the screwthreaded tubular parts of the container and closure member are formed to engage one another.

5. A closure member as claimed in Claim 1 for use with the combination as claimed in Claim 4 in which the closure member includes an annular rib having a surface arranged to co-operate with the frusto-conical surface on the container to form a substantially fluid-tight seal therewith when the closure member is fully screwed on to the container.

6. A container as claimed in Claim 1 or Claim 2 or Claim 3 provided with a circumferentially externally projecting rib so disposed as to engage the end of a similar container with which the container is nested in order to prevent jamming of one container within the other.

7. A closure for a container as claimed in Claim 1 comprising a disc-like part from the circumferential edge of which projects a tubular screwthreaded flange constituting the tubular screwthreaded part, wherein the disc-like part is provided with one or more projections arranged to prevent a similar closure jamming therein when nested therewith.

8. A container or a closure for a container constructed substantially as described with reference to the accompanying drawings.

9. The combination of a container and a closure thereof substantially as described with reference to the accompanying drawings

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929088 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

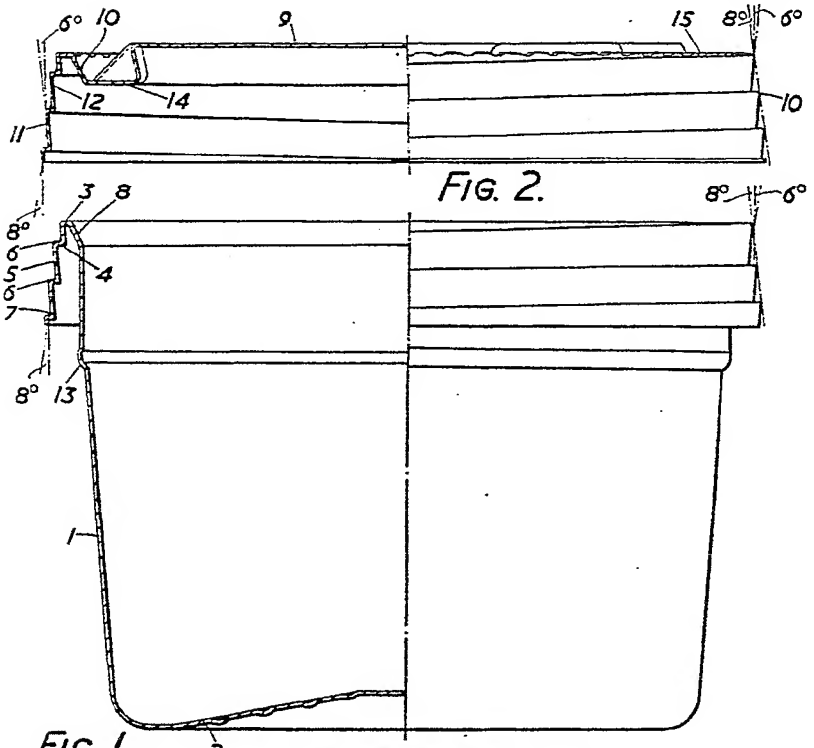

FIG. 2.

FIG. 1.

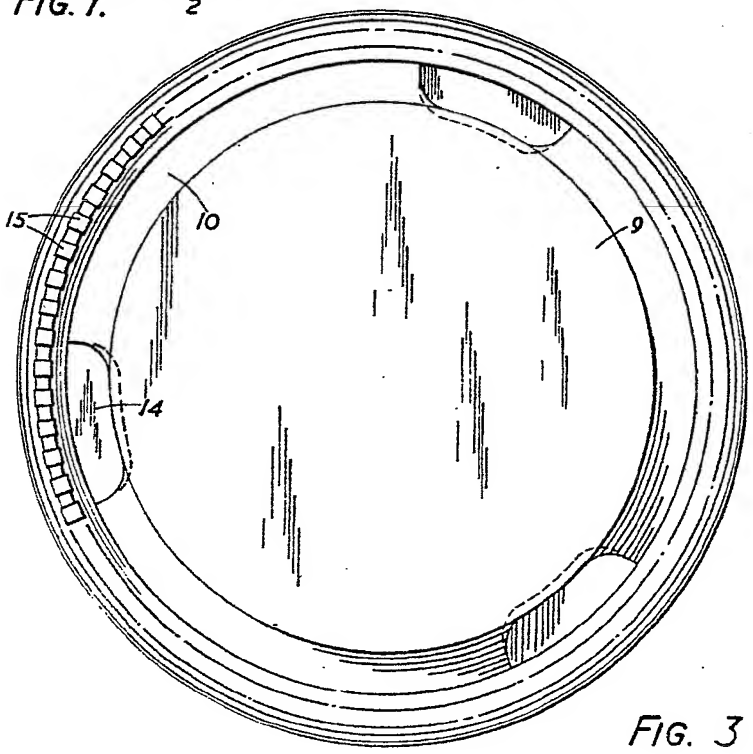

FIG. 3